SOFTSTART UK

ETHERNET/IP MODULE

USER MANUAL

Contents

1 Important User Information 2
2 Installation 3
3 Connection 4
4 Device Configuration 6
5 Operation 8
6 Packet Structures 10
7 Network Design 18
8 Specifications 20

1 Important User Information

1.1 Safety

Observe all necessary safety precautions when controlling the soft starter remotely. Alert personnel that machinery may start without warning.

It is the installer's responsibility to follow all instructions in this manual and to follow correct electrical practice.

Close attention is required to the electrical installation and the system design to avoid hazards either in normal operation or in the event of equipment malfunction. System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and this guide carefully.

1.2 Product Design

The Ethernet/IP Module allows a Softstart UK soft starter to connect to an Ethernet network and be controlled or monitored using an Ethernet communication model.

Separate modules are available for Profinet, Modbus TCP and Ethernet/IP networks.

The Ethernet/IP Module operates at the application layer. Lower levels are transparent to the user.

Familiarity with Ethernet protocols and networks is required to operate the Ethernet/IP Module successfully. For difficulties using this device with third party products, including PLCs, scanners and commissioning tools, contact the relevant supplier.

1.3 Compatibility

The Ethernet/IP Module is compatible with the following Softstart UK soft starters:

- LV-AS – 110/240 VAC control voltage.
  The Ethernet/IP Module is not suitable for use with LV-AS starters using 380/440 VAC control voltage.
- LV-DS – all models.
- MV-DS – all models.

1.4 Disclaimer

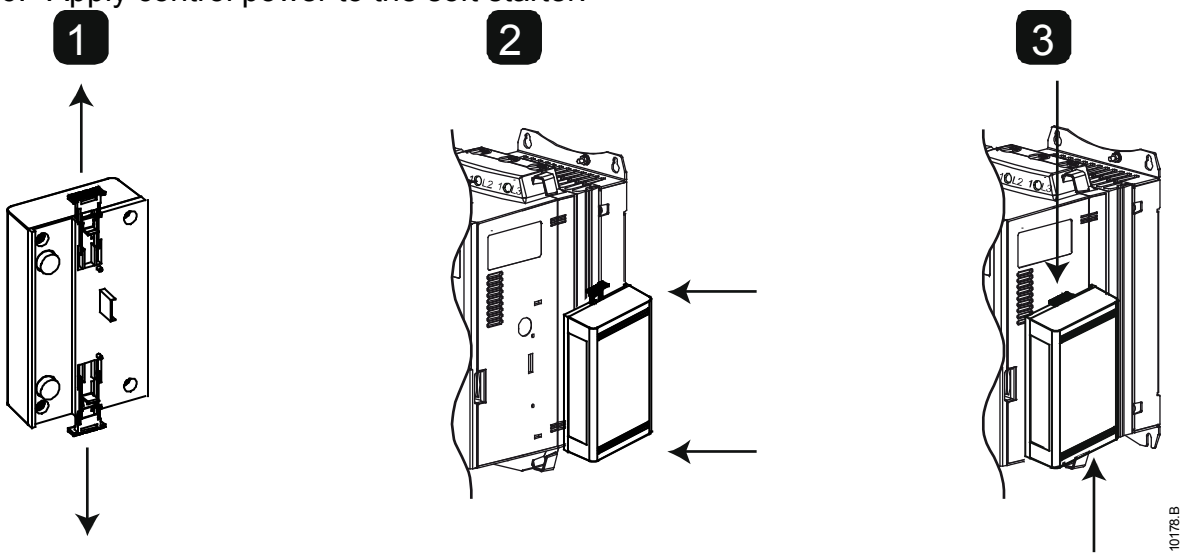
The examples and diagrams in this manual are included solely for illustrative purposes. The information contained in this manual is subject to change at any time and without prior notice. In no event will responsibility or liability be accepted for direct, indirect or consequential damages resulting from the use or application of this equipment.

2 Installation

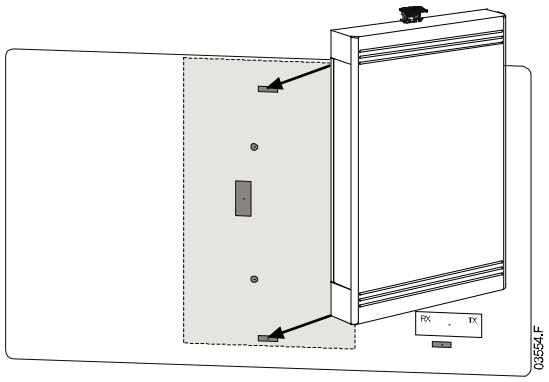
CAUTION
Remove mains and control voltage from the soft starter before attaching or removing accessories. Failure to do so may damage the equipment.

2.1 Installation Procedure

1. Remove control power and mains supply from the soft starter.
2. Fully pull out the top and bottom retaining clips on the module.
3. Line up the module with the comms port slot.
4. Push in the top and bottom retaining clips to secure the module to the starter.
5. Insert the network connector.
6. Apply control power to the soft starter.

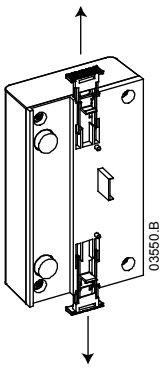


MV-DS:
Plug the module onto the back of the controller.



Remove the module using the following procedure:

1. Remove control power and mains supply from the soft starter.
2. Disconnect all external wiring from the module.
3. Fully pull out the top and bottom retaining clips on the module.
4. Pull the module away from the soft starter.



3 Connection

3.1 Soft Starter Connection

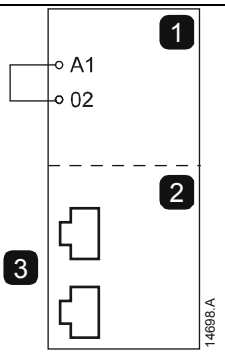
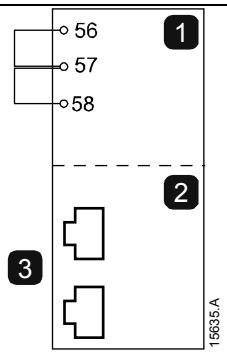
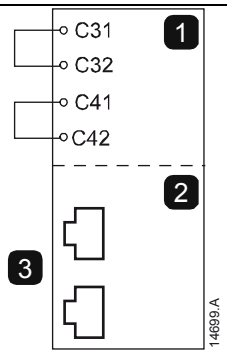
The Ethernet/IP Module is powered from the soft starter.

LV-AS: For the Ethernet/IP Module to accept fieldbus commands, a link must be fitted across terminals A1-02 on the soft starter.

The Ethernet/IP Module is not suitable for use with LV-AS starters using 380/440 VAC control voltage.

LV-DS and MV-DS: Input links are required across the stop and reset inputs if the soft starter is being operated in Remote mode. In Local mode, links are not required.

NOTE
LV-DS and MV-DS: Control via the fieldbus communication network is always enabled in local control mode, and can be enabled or disabled in remote control mode (parameter 6B *Comms in Remote*). See the soft starter user manual for parameter details.

LV-AS		LV-DS		MV-DS	
					
1	LV-AS A1, 02: Stop input	1	LV-DS (Remote mode) 56, 57: Stop input 58, 57: Reset input	1	MV-DS (Remote mode) C31, C32: Stop input C41, C42: Reset input
2	Ethernet/IP Module	2	Ethernet/IP Module	2	Ethernet/IP Module
3	RJ45 Ethernet ports	3	RJ45 Ethernet ports	3	RJ45 Ethernet ports

3.2 Network Connection

Ethernet Ports

The Ethernet/IP Module has two Ethernet ports. The ports are equal and interchangeable - if only one connection is required, either port can be used.

Cables

Use Category 5, 5e, 6 or 6e cable to connect to the Ethernet/IP Module.

EMC Precautions

To minimise electromagnetic interference, Ethernet cables should be separated from motor and mains cables by 200 mm.

If the Ethernet cable must cross motor or mains cables, the crossing should be at an angle of 90°.

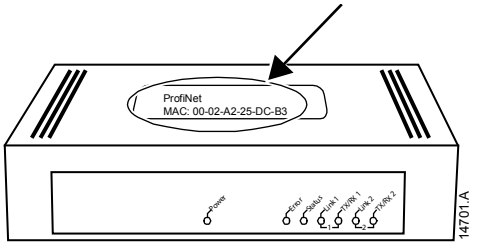
3.3 Network Establishment

The controller must establish communications directly with each module before the module can participate in the network. Once communications are established, the module can participate in an existing network.

3.4 Addressing

Each device in a network is addressed using a MAC address and an IP address, and can be assigned a symbolic name associated with the MAC address.

- The module will receive a dynamic IP address (via DHCP) when it is connected to the network, or can be assigned a static IP address during configuration.
- The symbolic name is optional and must be configured within the device.
- The MAC address is fixed within the device and is printed on a label on the front of the module.



4 Device Configuration

To permanently configure attributes in the Ethernet/IP Module, use the on-board web server.

NOTE
The Error LED flashes whenever the module is receiving power but is not connected to a network. The Error LED will flash throughout the configuration process.

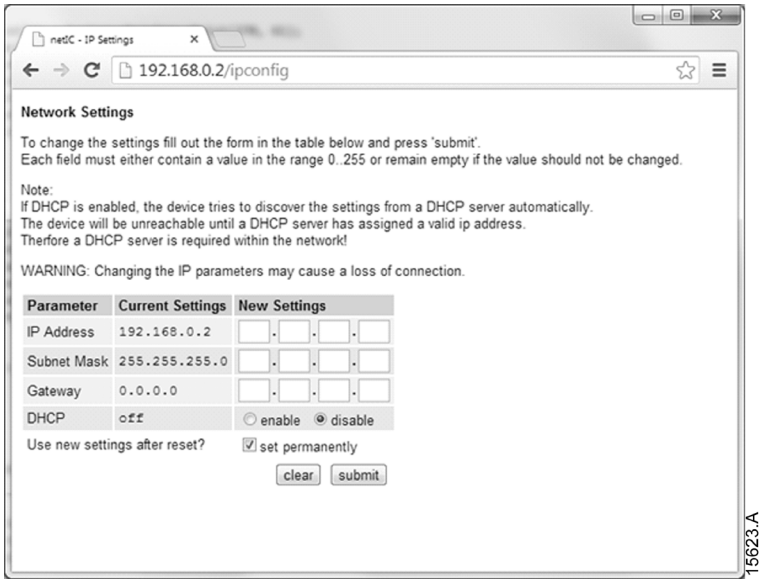
4.1 On-board Web Server

Ethernet attributes can be configured directly in the Ethernet/IP Module using the on-board web server.

NOTE
The default address for a new Ethernet/IP Module is 192.168.0.2. The default subnet mask is 255.255.255.0. The web server will only accept connections from within the same subnet domain. Use the Ethernet Device Configuration Tool to temporarily change the network address of the module to match the network address of the PC running the tool, if required.

To configure the device using the on-board web server:

1. Attach the module to a soft starter.
2. Connect one Ethernet port on the module to the Ethernet port of the PC.
3. Apply control power to the soft starter.
4. Start a browser on the PC and enter the device address, followed by /ipconfig. The default address for a new Ethernet/IP Module is 192.168.0.2.


netIC - IP Settings
192.168.0.2/ipconfig
Network Settings
To change the settings fill out the form in the table below and press 'submit'.
Each field must either contain a value in the range 0..255 or remain empty if the value should not be changed.
Note:
If DHCP is enabled, the device tries to discover the settings from a DHCP server automatically.
The device will be unreachable until a DHCP server has assigned a valid ip address.
Therfore a DHCP server is required within the network!
WARNING: Changing the IP parameters may cause a loss of connection.
Parameter
Current Settings
New Settings
IP Address
192.168.0.2
Subnet Mask
255.255.255.0
Gateway
0.0.0.0
DHCP
off
enable
disable
Use new settings after reset?
set permanently
clear
submit
15623.A

5. Edit the settings as required. Click "Submit" to save the new settings. To store the settings permanently in the module, tick "Set permanently".

NOTE
If you change the IP address and lose your record of it, use the Ethernet Device Configuration Tool to scan the network and identify the module.

NOTE
If you change the subnet mask, the web server will not be able to communicate with the module after the new settings are saved to the module.

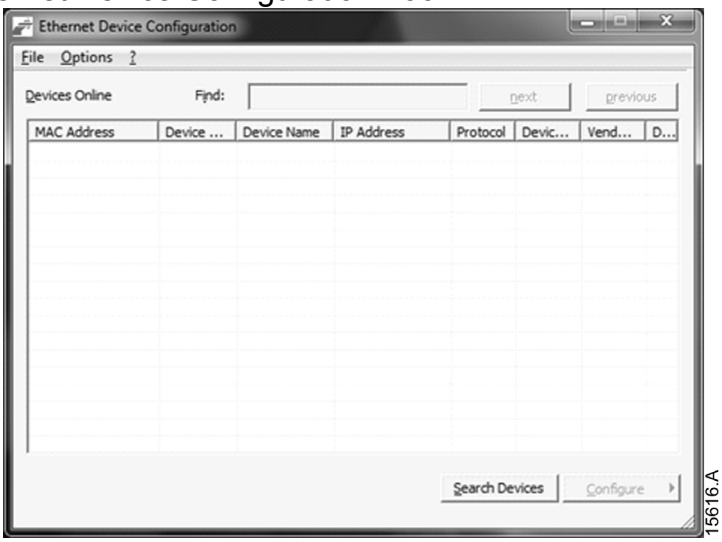
4.2 Ethernet Device Configuration Tool

The Ethernet Device Configuration Tool can be downloaded from www.softstartuk.com.

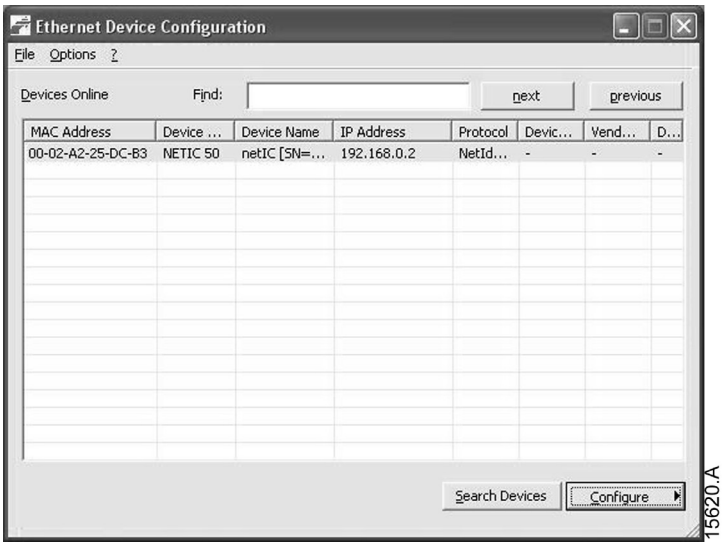
To permanently configure attributes in the Ethernet/IP Module, use the on-board web server. Changes made via the Ethernet Device Configuration Tool cannot be stored permanently in the Ethernet/IP Module.

To configure the device using the Ethernet Device Configuration Tool:

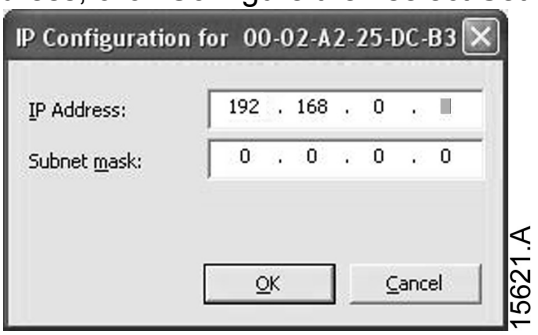
1. Attach the module to a soft starter.
2. Connect one Ethernet port on the module to the Ethernet port of the PC.
3. Apply control power to the soft starter.
4. Start the Ethernet Device Configuration Tool.



5. Click on Search Devices. The software will search for connected devices.



6. To set a static IP address, click Configure then select Set IP address.



5 Operation

The Ethernet/IP Module has been designed for use in a system complying with the ODVA Common Industrial Protocol. For successful operation, the scanner must also support all functions and interfaces described in this document.

5.1 Device Classification

The Ethernet/IP Module is an Adapter class device and must be managed by a Scanner class device over Ethernet.

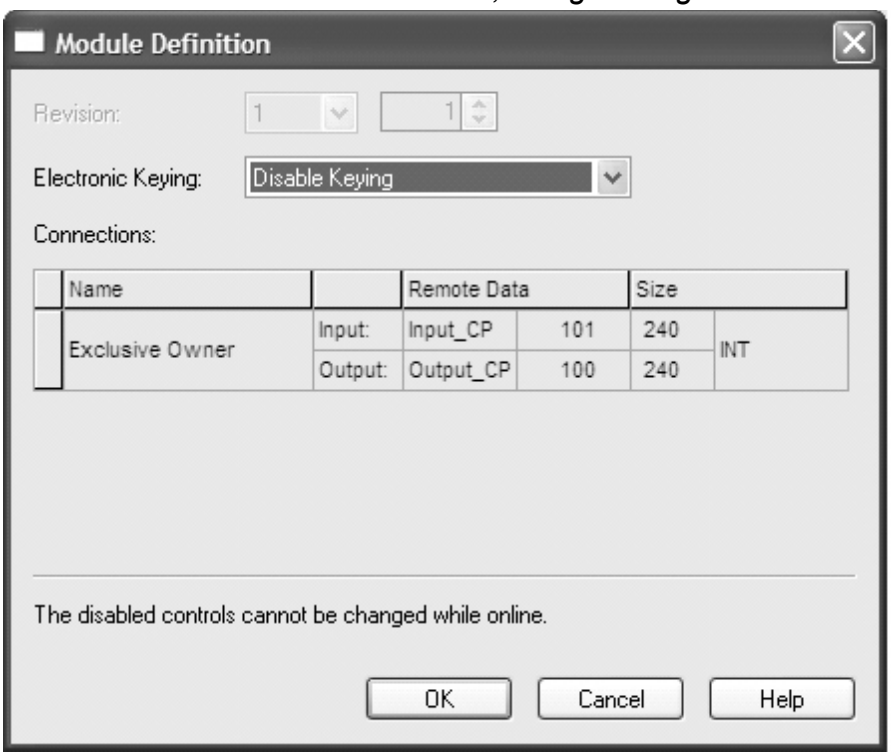
5.2 Scanner Configuration

EDS File

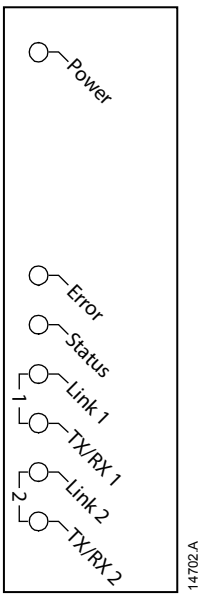
An EDS file is available from www.softstartuk.com. The EDS file contains all required attributes of the Ethernet/IP Module.

Once the EDS file has been loaded, the individual Ethernet/IP Module must be defined. Input/Output registers must be 240 bytes in size, and type INT.

Module definition of the Ethernet/IP Module, using RSLogix 5000



5.3 LEDs



LED name	LED Status	Description
Power	Off	Module is not powered up.
	On	Module is receiving power.
Error	Off	Module is not powered up or does not have an IP address.
	Flashing	Connection timeout.
	On	Duplicate IP address.
Status	Off	Module is not powered up or does not have an IP address.
	Flashing	Module has obtained an IP address but has not established any network connections.
	On	Communication has been established.
Link x	Off	No network connection.
	On	Connected to a network.
TX/RX x	Flashing	Transmitting data.

6 Packet Structures

NOTE
All references to registers mean the registers within the module unless otherwise stated.

NOTE
Some soft starters do not support some functions.

6.1 Ensuring Safe and Successful Control

Data written to the Ethernet/IP Module will remain in its registers until the data is overwritten or the module is reinitialised. The Ethernet/IP Module will not transfer successive duplicate commands to the soft starter.

NOTE
If the soft starter is started via fieldbus communications but stopped via the keypad or a remote input, an identical start command cannot be used to restart the starter.

In order to operate safely and successfully in an environment where the soft starter may also be controlled via the keypad or the remote inputs (as well as via fieldbus communications), a control command should be immediately followed by a status query to confirm the command has been actioned.

6.2 Control Commands (Write Only)

Use the following structures to send a control command to the soft starter:

Byte	Bit	Function
0	0	0 = Stop command 1 = Start command
	1	0 = Enable Start or Stop command 1 = Quick Stop (ie coast to stop) and disable Start command
	2	0 = Enable Start or Stop command 1 = Reset command and disable Start command
	3 to 7	*Reserved*
1	0 to 1	0 = Use soft starter remote input to select motor set 1 = Use primary motor set when starting [1] 2 = Use secondary motor set when starting [1] 3 = *Reserved*
	2 to 7	*Reserved*

[1] Ensure that the programmable input is not set to Motor Set Select before using this function.

6.3 Status Commands (Read Only)

NOTE
Some soft starters do not support some functions. Voltage values are only available from medium voltage soft starters.

Use the following structures to query the soft starter's status:

Byte	Bit	Function	Details
0	0	Trip	1 = Tripped
	1	Warning	1 = Warning
	2	Running	0 = Unknown, not ready, ready to start or tripped 1 = Starting, running, stopping or jogging
	3	*Reserved*	
	4	Ready	0 = Start or stop command not acceptable 1 = Start or stop command acceptable
	5	Control from Net	1 = Always except in Program mode
	6	Local/Remote	0 = Local control 1 = Remote control
	7	At reference	1 = Running (full voltage at the motor)
1	0 to 7	Status	0 = Unknown (menu open) 2 = Starter not ready (restart delay or thermal delay) 3 = Ready to start (including warning state) 4 = Starting or running 5 = Soft stopping 7 = Trip 8 = Jog forward 9 = Jog reverse
2-3	0 to 15	Trip/Warning code	See Trip Codes on page 16
4 [1]	0 to 7	Motor current (low byte)	Current (A)
5 [1]	0 to 7	Motor current (high byte)	
6	0 to 7	Motor 1 temperature	Motor 1 thermal model (%)
7	0 to 7	Motor 2 temperature	Motor 2 thermal model (%)
8-9	0 to 5	*Reserved*	
	6 to 8	Product parameter list version	
	9 to 15	Product type code [2]	
10	0 to 7	*Reserved*	
11	0 to 7	*Reserved*	
12 [3]	0 to 7	Changed parameter number	0 = No parameters have changed 1~255 = Index number of the last parameter changed
13	0 to 7	Parameters	Total number of parameters available in the starter

Byte	Bit	Function	Details
14-15	0 to 13	Changed parameter value [3]	Value of the last parameter that was changed, as indicated in byte 12
	14 to 15	*Reserved*	
16	0 to 4	Starter state	0 = *Reserved* 1 = Ready 2 = Starting 3 = Running 4 = Stopping 5 = Not ready (restart delay, restart temperature check, run simulation) 6 = Tripped 7 = Programming mode 8 = Jog forward 9 = Jog reverse
	5	Warning	1 = Warning
	6	Initialised	0 = Unintialised 1 = Initialised
	7	Local/Remote	0 = Local control 1 = Remote control
17	0	Parameters	0 = Parameter(s) have changed since last parameter read 1 = No parameters have changed
	1	Phase sequence	0 = Negative phase sequence 1 = Positive phase sequence
	2 to 7	Trip code [4]	See Trip Codes on page 16
18-19	0 to 13	Current	Average rms current across all three phases
	14 to 15	*Reserved*	
20-21	0 to 13	Current (% motor FLC)	
	14 to 15	*Reserved*	
22	0 to 7	Motor 1 thermal model (%)	
23	0 to 7	Motor 2 thermal model (%)	
24-25 [5]	0 to 11	Power	
	12 to 13	Power scale	
	14 to 15	*Reserved*	
26	0 to 7	% Power factor	100% = power factor of 1
27	0 to 7	*Reserved*	
28	0 to 7	*Reserved*	
29	0 to 7	*Reserved*	
30-31	0 to 13	Phase 1 current (rms)	
	14 to 15	*Reserved*	
32-33	0 to 13	Phase 2 current (rms)	
	14 to 15	*Reserved*	

Byte	Bit	Function	Details
34-35	0 to 13	Phase 3 current (rms)	
	14 to 15	*Reserved*	
36-37	0 to 7	Phase 1 voltage (rms)	medium voltage products only
	14 to 15	*Reserved*	
38-39	0 to 7	Phase 2 voltage (rms)	medium voltage products only
	14 to 15	*Reserved*	
40-41	0 to 7	Phase 3 voltage (rms)	medium voltage products only
	14 to 15	*Reserved*	
42	0 to 7	Parameter list minor revision	
43	0 to 7	Parameter list major revision	
44	0 to 7	Digital Input state	For all inputs, 0 = open, 1 = closed (shorted) 0 = Start 1 = Stop 2 = Reset 3 = Input A 4 = Input B 5 to 15 = *Reserved*
45-70	0 to 7	*Reserved*	

[1] For models LV-DS-0053B and smaller this value will be 10 times greater than the value displayed on the keypad.

[2] Product type code:

4 = LV-AS
9 = LV-DS
11 = MV-DS

[3] Reading bytes 14-15 (Changed parameter value) will reset byte 12 (Changed parameter number) and bit 0 of byte 17 (Parameters have changed). Always read bytes 12 and 17 before reading bytes 14-15.

[4] Bits 2~7 of byte 17 report the soft starter's trip or warning code. If the value of bits 0~4 of byte 16 is 6, the soft starter has tripped. If bit 5 = 1, a warning has activated and the starter is continuing to operate.

[5] Powerscale functions as follows:

0 = multiply Power by 10 to get W
1 = multiply Power by 100 to get W
2 = Power is represented in kW
3 = multiply Power by 10 to get kW

6.4 Soft Starter Internal Register Addresses

Internal registers within the soft starter have the following functions. These registers are not directly accessible via fieldbus.

Register Address	Description	Bits	Details
0	Version	0 to 5	*Reserved*
		6 to 8	Product parameter list version
		9 to 15	Product type code [1]
1	Device details		
2 [2]	Changed parameter number	0 to 7	0 = No parameters have changed 1~255 = Index number of the last parameter changed
		8 to 15	Total number of parameters available in the starter
3 [2]	Changed parameter value	0 to 13	Value of the last parameter that was changed, as indicated in register 2
		14 to 15	*Reserved*
4	Starter state	0 to 4	0 = *Reserved* 1 = Ready 2 = Starting 3 = Running 4 = Stopping 5 = Not ready (restart delay, restart temperature check, run simulation) 6 = Tripped 7 = Programming mode 8 = Jog forward 9 = Jog reverse
		5	1 = Warning
		6	0 = Unintialised 1 = Initialised
		7	0 = Local control 1 = Remote control
		8	0 = Parameter(s) have changed since last parameter read 1 = No parameters have changed [2]
		9	0 = Negative phase sequence 1 = Positive phase sequence
		10 to 15	See Trip Codes on page 16 [3]
5	Current	0 to 13	Average rms current across all three phases [4]
		14 to 15	*Reserved*
6	Current	0 to 9	Current (% motor FLC)
		10 to 15	*Reserved*
7	Motor temperature	0 to 7	Motor 1 thermal model (%)
		8 to 15	Motor 2 thermal model (%)
8 [5]	Power	0 to 11	Power
		12 to 13	Power scale
		14 to 15	*Reserved*

Register Address	Description	Bits	Details
9	% Power factor	0 to 7	100% = power factor of 1
		8 to 15	*Reserved*
10	Voltage	0 to 13	Average rms voltage across all three phases (medium voltage products only)
		14 to 15	*Reserved*
11 [4]	Current	0 to 13	Phase 1 current (rms)
		14 to 15	*Reserved*
12 [4]	Current	0 to 13	Phase 2 current (rms)
		14 to 15	*Reserved*
13 [4]	Current	0 to 13	Phase 3 current (rms)
		14 to 15	*Reserved*
14	Voltage	0 to 13	Phase 1 voltage, rms (medium voltage products only)
		14 to 15	*Reserved*
15	Voltage	0 to 13	Phase 2 voltage, rms (medium voltage products only)
		14 to 15	*Reserved*
16	Voltage	0 to 13	Phase 3 voltage, rms (medium voltage products only)
		14 to 15	*Reserved*
17	Parameter list version number	0 to 7	Parameter list minor revision
		8 to 15	Parameter list major version
18	Digital Input state	0 to 15	For all inputs, 0 = open, 1 = closed (shorted) 0 = Start 1 = Stop 2 = Reset 3 = Input A 4 = Input B 5 to 15 = *Reserved*
19-31	*Reserved*		

[1] Product type code:

4 = LV-AS
9 = LV-DS
11 = MV-DS

[2] Reading register 3 (Changed parameter value) will reset registers 2 (Changed parameter number) and 4 (Parameters have changed). Always read registers 2 and 4 before reading register 3.

[3] Bits 10~15 of register 4 report the soft starter's trip or warning code. If the value of bits 0~4 is 6, the soft starter has tripped. If bit 5 = 1, a warning has activated and the starter is continuing to operate.

[4] For models LV-DS-0053B and smaller this value will be 10 times greater than the value displayed on the keypad.

[5] Powerscale functions as follows:

0 = multiply Power by 10 to get W
1 = multiply Power by 100 to get W

2 = Power is represented in kW
3 = multiply Power by 10 to get kW

6.5 Parameter Management (Read/write)

Parameter values can be read from or written to the soft starter.

If Output Register 57 of the scanner is set greater than zero (0), the Ethernet/IP Module will write all parameter registers to the soft starter.

Enter the required parameter values in the output registers of the scanner. The value of each parameter is stored in a separate register. Each register corresponds to two bytes.

- Register 57 (bytes 114-115) corresponds to parameter 1A *Motor Full Load Current*
- The LV-DS has 102 parameters. Register 158 (bytes 316-317) corresponds to parameter 16M *Low Control Volts*.

NOTE
When writing parameter values, the Ethernet/IP Module will update all parameter values in the soft starter. Always enter a valid value for every parameter.

6.6 Trip Codes

The trip code is reported in bytes 2-3 and 17 of the Status Commands.

Trip Code	Description	LV-AS	LV-DS	MV-DS
0	No trip	●	●	●
11	Input A trip		●	●
20	Motor overload	●	●	●
21	Heatsink overtemperature		●	●
23	L1 phase loss		●	●
24	L2 phase loss		●	●
25	L3 phase loss		●	●
26	Current imbalance	●	●	●
27	Ground fault			●
28	Instantaneous overcurrent		●	●
29	Undercurrent		●	●
50	Power loss	●	●	●
54	Phase sequence	●	●	●
55	Frequency	●	●	●
60	Unsupported option (function not available in inside delta)		●	●
61	FLC too high		●	●
62	Parameter out of range		●	●
70	Miscellaneous		●	●
75	Motor thermistor	●	●	●
101	Excess start time	●	●	●
102	Motor connection		●	●
104	Internal fault x (where x is the fault code detailed in the table below)		●	●
105	Bypass fail (bypass contactor)			●

Trip Code	Description	LV-AS	LV-DS	MV-DS
110	Input B trip			●
113	Starter communication (between module and soft starter)	●	●	●
114	Network communication (between module and network)	●	●	●
115	L1-T1 shorted		●	●
116	L2-T2 shorted		●	●
117	L3-T3 shorted		●	●
118	Motor 2 overload		●	●
119 [1]	Time-overcurrent (Bypass overload)	●	●	
120	SCR overtemperature			●
121	Battery/clock		●	●
122	Thermistor circuit		●	
132	Analog input trip			●

[1] For LV-DS, time-overcurrent protection is only available on internally bypassed models.

Internal Fault x

The table below details the internal fault code associated with trip code 104.

Internal fault	Message displayed on the keypad
70 ~ 72	Current Read Err Lx
73	ATTENTION! Remove Mains Volts
74 ~ 76	Motor Connection Tx
77 ~ 79	Firing Fail Px
80 ~ 82	VZC Fail Px
83	Low Control Volts
84 ~ 98	Internal fault X Contact your local supplier with the fault code (X).

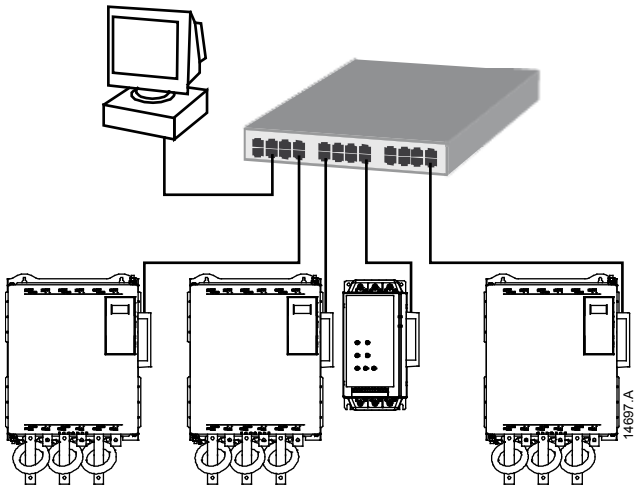
NOTE
Only available on LV-DS and MV-DS soft starters. For parameter details, see the soft starter User Manual.

7 Network Design

The Ethernet/IP Module supports star, line and ring topologies.

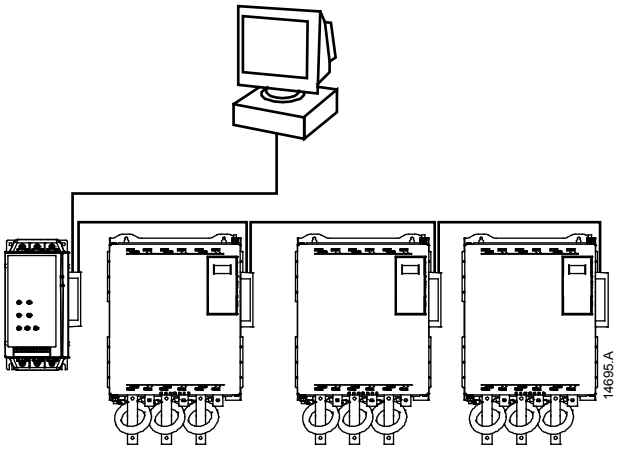
7.1 Star Topology

In a star network, all controllers and devices connect to a central network switch.



7.2 Line Topology

In a line network, the controller connects directly to one port of the first Ethernet/IP Module. The second Ethernet port of the Ethernet/IP Module connects to another module, which in turn connects to another module until all devices are connected.



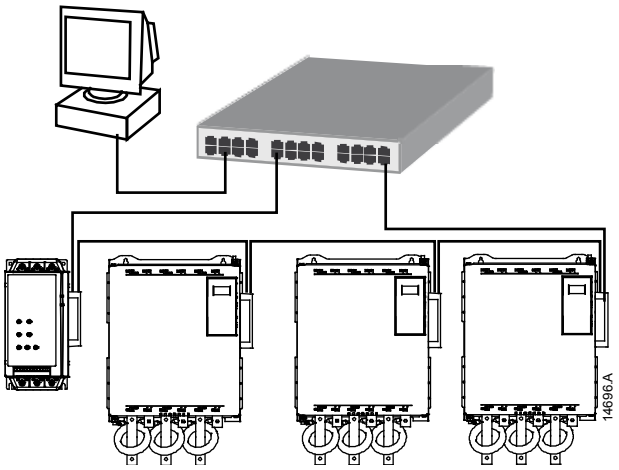
NOTE
The Ethernet/IP Module has an integrated switch to allow data to pass through in line topology. The Ethernet/IP Module must be receiving control power from the soft starter for the switch to operate.

NOTE
If the connection between two devices is interrupted, the controller cannot communicate with devices after the interruption point.

NOTE
Each connection adds a delay to communication with the next module. The maximum number of devices in a line network is 32. Exceeding this number may reduce the reliability of the network.

7.3 Ring Topology

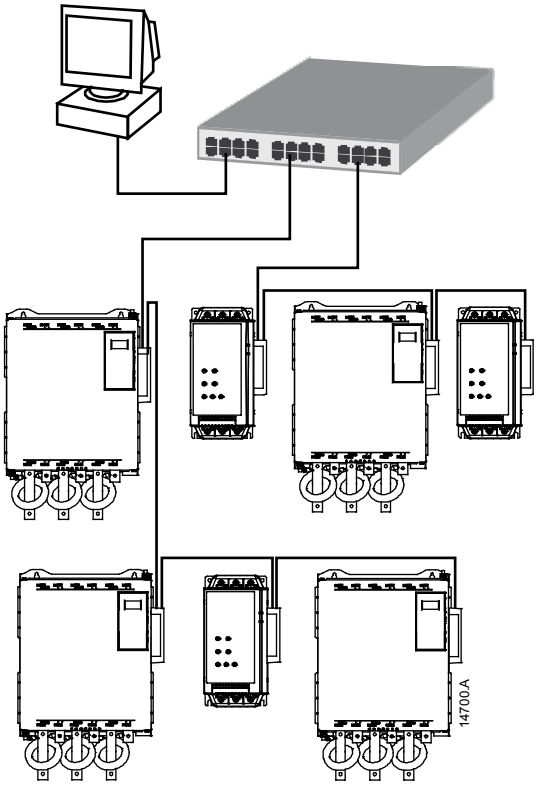
In a ring topology network, the controller connects to the first Ethernet/IP Module, via a network switch. The second Ethernet port of the Ethernet/IP Module connects to another module, which in turn connects to another module until all devices are connected. The final module connects back to the switch.



NOTE
The network switch must support loss of line detection.

7.4 Combined Topologies

A single network can include both star and line components.



8 Specifications

Enclosure

Dimensions ..... 40 mm (W) x 166 mm (H) x 90 mm (D)
Weight ..... 250 g
Protection IP20

Mounting

Spring-action plastic mounting clips (x 2)

Connections

Soft starter ..... 6-way pin assembly
Contacts ..... Gold flash
Network RJ45

Settings

IP address ..... Automatically assigned, configurable
Device name ..... Automatically assigned, configurable

Network

Link speed ..... 10 Mbps, 100 Mbps (auto-detect)
Full duplex
Auto crossover

Power

Consumption (steady state, maximum) ..... 35 mA at 24 VDC
Reverse polarity protected
Galvanically isolated

Certification

C✓ ..... IEC 60947-4-2
CE ..... IEC 60947-4-2
ODVA ..... EtherNet/IP conformance tested

710-15804-00A